

MICROSERVICES INTEGRATION PLATFORM V7

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A DIGITAL SERVICE PROVIDER SOLUTION

Principals

AwareX is a full stack digital customer engagement platform. We provide a comprehensive, end to end system to enable Communication Service Providers to reduce operational costs to serve customers, increase revenues with context aware upsell and improve their Net Promoter Score NPS.

At the heart of the awareX stack is the microservices Integration Platform. A cloud based highly available, secure, scalable system which integrates the data from multiple back end systems (largely BSS) and enables its use by end customers via a wide range of digital channels. You can consider it as a mediation device which provides a single source of data for multiple front ends from a diverse set of back end systems.

Microservices enables the following key functions: -

- Creation of independent customer journeys on a per 'service type' basis
- Integration of multiple disparate sources of data
- Combination and logic processing of data to produce customer meaningful information
- Incremental addition of new Value
- A defined API environment, facilitating clearly defined architectural separation
- Delivery to a suite of Omni Client digital front ends from a single source with dependability and reliability
- Compliance to the TMF ODA architectural standards

Microservices allow the separation as components via API's of the back-end system of record BSS, the integration and combination of data to meet end customer needs, the presentation of the data through an omni client approach, the analytics of customer usage and the marketing to end users through a campaign manager.

The autonomous stateless platform can scale without impacting the performance of legacy or new BSS, supports individual customer journeys which can be added to support a full range of service types in an agile and resilient manner.

The AwareX platform has been built to align and comply with the TMF ODA standard architecture.

Description

The awareX digital Omni-Client system provides a product solution which enables CSP's to offer a full suite of digital channels to sit on top of their existing backend BSS environments, effectively upgrading them to modern always on customer engagement systems. The Suite includes the Native apps for Apple (iOS) and Android Smartphones, Bots for Facebook and SMS feature phones, Web sites and Voice interaction with Alexa and Google voice units.

At the heart of this capability is the cloud based microservices integration platform. It is the fundamental integration and control point between the back end or legacy data systems and the digital clients which end customers use to undertake their service or purchase journeys.

The platform technology is primarily Node JavaScript, Java and REST JSON for the connection between the platform and the client devices, facilitating enhanced architectural flexibility. We also use WordPress for part of the CMS and Kabana, Elastic Search and Logstash for ease of system monitoring and control.

The platform in adhering to the TMF ODA standards is component based and in total is comprised of the following primary components: -

- Microservices Integration
 - API – Common RESTful, SOAP, RSA
 - Data Plug-ins including Logic Processing
 - Hypertext protocol secure HTTPS security manager
 - Parallel data loader
 - Super secure authentication manager
 - Omni-Client Adapters, Model View Controller/Translator
 - Bot Server
 - AWS simple message system integration
 - Audit log manager
- Engagement Platform
 - API
 - Marketing
 - Campaign Management
 - Push
 - Analytics
 - Insights and Segmentation
 - Personalization
 - Reporting
- Content Management System CMS
 - Dynamic content upgrade manager
 - Animations
 - Video
 - Images
 - Text
 - Surveys

- Locations
- Monitoring and Operations
 - SLA Management
 - Dashboard, Operational data visualization
 - Ticket Management
 - Events log and Audit, Search and analytics engine
 - Server-side data processing pipeline for simultaneous multi source data ingestion

Carrier Grade Non-Functional Capability

The microservices integration platform is delivered from the Cloud and is architected to provide required 'Carrier Grade' nonfunctional Capabilities: -

- High Availability
 - The platform is architected as an Active/Active multiple server configuration as standard with load balancing to ensure no single point of failure. Multiple AWS Cloud service zones are utilized by separate servers for added resilience.
- Graceful degradation
 - The platform architecture ensures that at worst the service to end customers suffers graceful degradation rather than failure. The monitoring tools actively report user response times as well as system status.
- SLA
 - AwareX supports a 99.99% service availability SLA as standard, this can be increased to 99.999% through the use of multiple resilient Metro area Active/Active Clouds.
- Scalability
 - The system is designed as a native cloud platform and supports elastic horizontal scaling. Our current busy hour record is 22,000 TPM, 2,450 TPS, the CPU busy minute utilization peaked at only 53%, with a modal end customer round journey response time in the range 500 to 600 milliseconds.
- Security
 - Taking advantage of the fundamental security of AWS plus our partnership with Verisign and NCC, secure by design, we use encrypted SSL over HTTPs for encrypted data transfers, We also use code scanning and active monitoring.
 - AwareX proprietary security includes enhanced authentication to stop any distributed denial of service attack. We internally authenticate to RS204, the highest available encryption standard using Tokens for any device requests only allowing genuine end users to access the platform service thus stopping completely any possible distributed denial of service attacks.
- Manageability
 - Suite of operational monitoring tools allow the operations team to deliver service availability 24*7*365. Service providers can have a dashboard showing the system and operational KPI's in real time, receive alerts via e-mail or integrated to their own Trouble Ticketing systems and awareX provides a support portal for all interaction needs.

- Changeable
 - The Platform can be updated with new content for the digital channels, features and functions without removing it from service, on the fly upgrades of the Apps are supported.
- Unlimited data analytics
 - The Platform supports the collection of unlimited data volumes for use by the Analytics component. Data collection is holistic across all device client types.
- Push
 - Service Providers can use the Platform to send unlimited Push communications to their customers.
- Omni clients
 - The Platform provides a common API to enable the use of unlimited and variable Device Clients. There is no restriction on device type, Operating System or OS version.
- ESCROW
 - Service assurance under all circumstances is facilitated by the awareX partnership with NCC for our innovative Cloud credential Escrow. This ensures whatever happens your service to end users will always be available.

System Architecture

The conceptual architecture of how the Microservices Integration Platform fits into the total AwareX Stack is shown below.

There are two fundamental classes of back end integrations: -

- BSS or Business Support Systems – A class of high transaction processing and data base systems used by CSP's to manage their business.
- Enterprise Systems – Commercial systems used for general purposes by a wide range of businesses, for example warehousing, ERP, inventory and expense management.

There are six supported service types: -

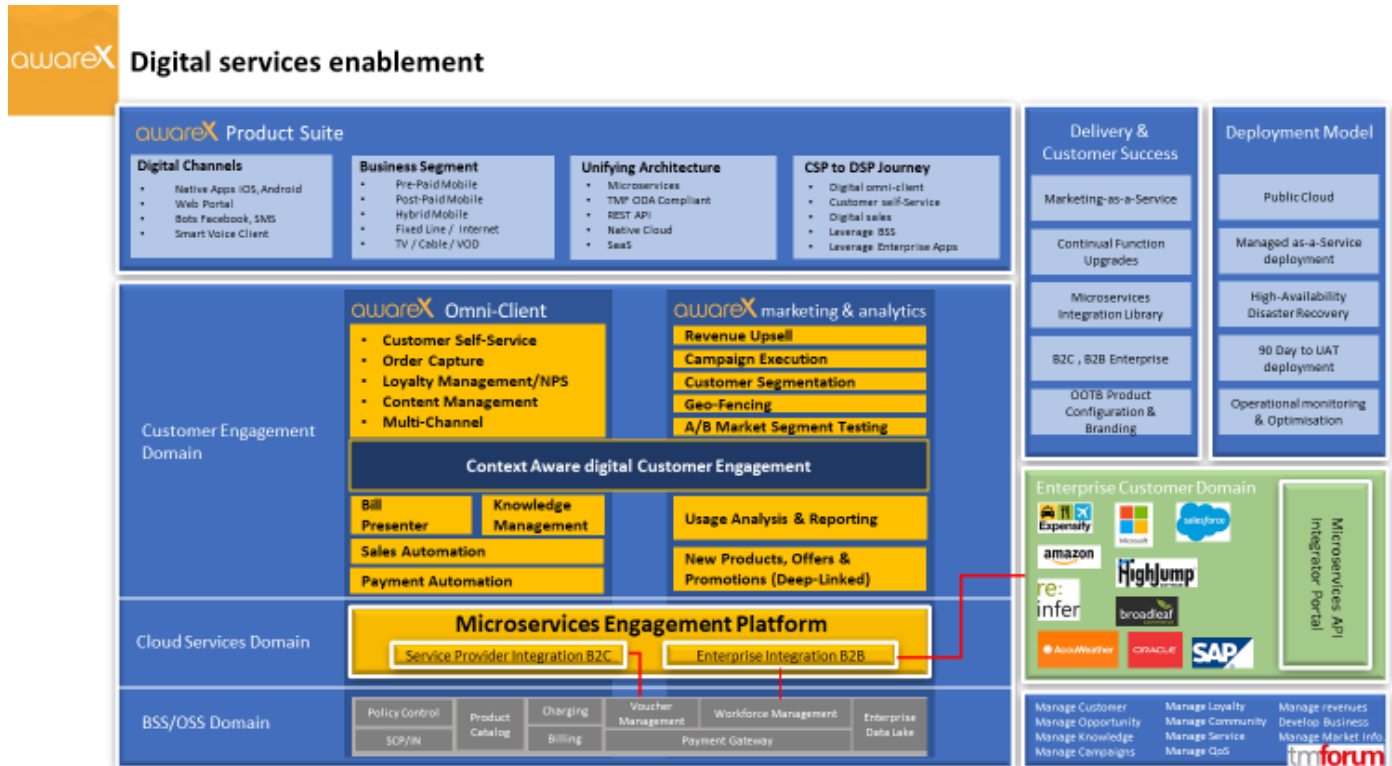
- Mobile Pre-Paid
- Mobile Post-Paid
- Mobile Hybrid
- Fixed Line
- Internet
- Cable TV / VOD

There are unlimited digital clients(conceptually) with 7 supported 'out of the box' today: -

- Native Smartphone Apps
 - Android
 - iOS
- Web Portal (Responsive)
- Bots
 - Facebook
 - SMS

- Smart Voice Clients
 - Google
 - Amazon Alexa

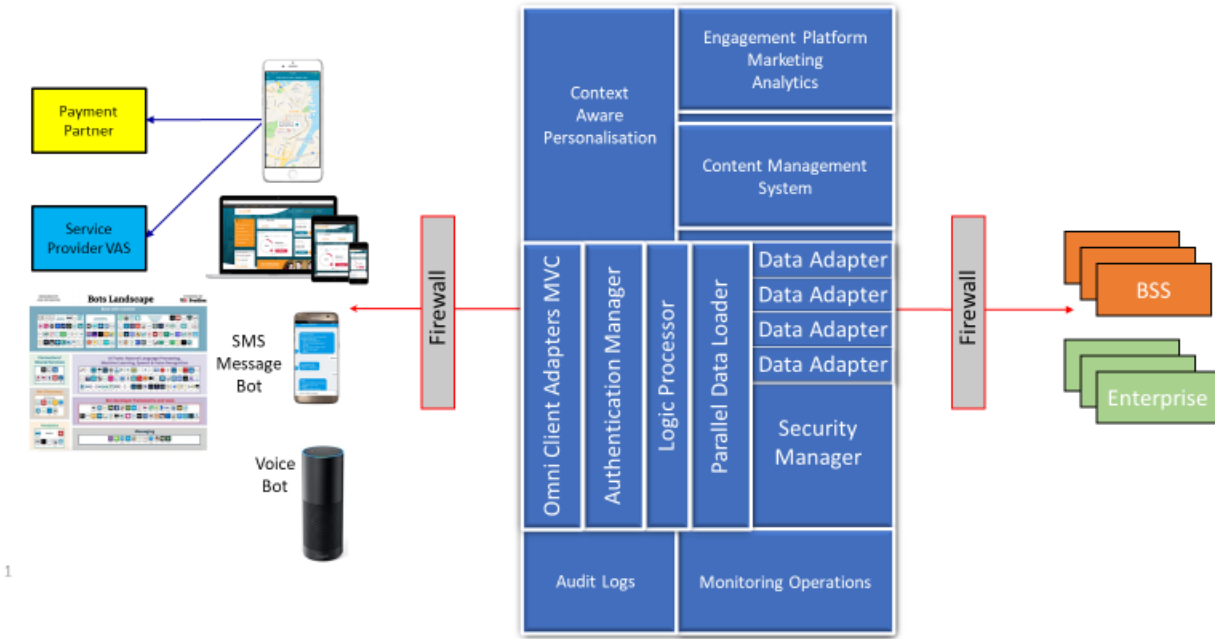
The diagram below shows how the components are linked and how the service is deployed and delivered.



Microservices: A software architecture in which complex applications are composed of small, independent processes which facilitates a modular approach to system building.

Technical Architecture

The diagram below shows the platform technical architecture.



Selected Platform Components: -

Surveys

The platform supports a wide variety of survey types with different look and feels. The surveys include Net promoter Score NPS as well as other customer satisfaction metrics. The surveys can be triggered by any event which you set in the CMS, the data is collected and reported to you.

Dashboards

Business

An executive dashboard is available which provides an easy to read display of all customer usage interactions, customer usage patterns, revenue sales as well as high level system performance metrics.

Operations

An operations and systems management dashboard is available which provides full visibility of all technical monitoring and control aspects of the system and digital channels.

Reporting

Add hoc and standard reporting of customer usage data and patterns is fully supported. You can have standard reports e-mailed to you weekly or undertake any add hoc reporting with easy to use click and select graphical reporting tools.

Speed to Deploy

AwareX has a standard, repeatable and quality focused implementation procedure which is highly automated, this allows the Microservice Integration Platform to be installed within a few weeks and the end to end system to be live within 3 to 4 months depending upon the service types selected.

Hybrid Deployment Option.

The microservice integration platform is a native cloud design. We recommend it is delivered from the public cloud, however if you require a hybrid implementation the system also support this in one of three ways.

- AWS Outposts, this allows the system to operate as if it is in the AWS cloud but physically resides in a local data center of your choice, such as your own inhouse data center.
- A private cloud, if you operate a private cloud awareX integration platform can run on it, however we will need to understand details equivalent to AWS such as security, operations and configuration.
- On-prem, we can even run on local hardware in your data center, although this will extend the project implementation time and we will need to understand details equivalent to AWS such as security, operations and configuration

Holistic View

The use of a platform in the awareX stack allow you to gain a holistic view across all digital customer engagements, there are no islands of isolated data between web and apps or apps and voice but rather you customer base as a whole can be seen as it engages with you digitally.

Global Support

AwareX systems are currently running and supporting customers in every region of the world, each receiving the same consistent support levels.

Upgradable

The software right to use license for the Microservices Integration Platform includes the RTU all future releases and upgrades without the need to pay for any additional or new features or functions which are provided in future Generally Available GA software releases. This means you can enjoy enhanced functionality based upon our product roadmap at no additional cost except the fees for the upgrade implementation services.

Managed Service

Digital channels can be quick and easy for you even if you are concerned about your level of digital skills. AwareX is a managed service which means after implementation we run the service for you, manage the hardware, environment, software, service level and support to ensure you can focus on your customers.

Software Philosophy

Every piece of software delivered by AwareX has the concept of Product behind it, repeatable, stable, upgradable, secure, scalable and supportable. Because this is a product every aspect of the overall system has evolved and been thought through to be a true solution.

Pre-Integrated Interfaces

We support a large number of interfaces to the popular back end BSS systems as shown below. This enables fast and assured integration to your BSS systems. We also integrate with the API's exposed by Enterprise Service Busses, API servers as well as RPA and direct connect.



Security Testing

As a standard product both AwareX and its customers conduct regular PEN testing of the system allowing us to review results regularly and ensure we are current with the evolving threat. Since this is not a one-off event for us the product approach enables better security through more testing than a custom app would ever endure. AwareX has a partnership with Verisign and NCC to ensure we are secure by design, we use static code scanning and active monitoring.

AwareX proprietary security includes enhanced authentication to stop any distributed denial of service attack. We internally authenticate to RS204, the highest available encryption standard using Tokens for any device requests only allowing genuine end users to access the platform service thus stopping completely any possible distributed denial of service attacks.

Support

Software support and maintenance is provided for the product. We provide a support portal for customer use which enables all the usual product reporting and queries to be handled as tickets with an SLA. New GA software release versions are regression tested and we expect a zero defects release. However, should a bug be identified a full support process with escalation is provided.

Operations

We use a standardized industry set of operational tools 'ELK' configured to provide a full operational management and monitoring capability. Since they are monitoring a product, we have standard dashboards and alarms which enable a 24*7*365 support model with a choice of 4 nines or 5 nines availability SLA.

High Availability

The Product has been architected to be active/active Highly Available (HA) in every implementation. It is delivered as standard with 99.99% service availability SLA. This can be extended to 99.999% availability SLA if required. (see separate white paper on AwareX high availability and DR).

Data Security

The AwareX suite is GDPR compliant, this is the strict EU personal data privacy and data security specification. We use encryption, tokens and hashing to ensure no personal data is every attributable to an individual and we hold no personal or private data on our systems. Our long-term storage provides logs for analytics and operations use only and it is not possible to identify any personal data from them.

We internally authenticate to RS204, the highest available encryption standard using Tokens for any device requests only allowing genuine end users to access the platform service thus stopping completely any possible distributed denial of service attacks.

Analytics

The system includes a full productized analytics suite also delivered from the cloud, it is fully integrated with the other elements of the AwareX offering with 'OOTB' reporting and dashboards. It is totally integrated right out of the box and drives the marketing capability.

Marketing

The AwareX product includes a fully integrated analytics and marketing system to enable context aware personalization for effective customer communication and up-sell. AwareX's Engagement & Analytics Platform delivers an increase in active app users as well as higher retention. It is designed to deliver timely and personalized messages to coincide with a marketing promotion (for example a seasonal discount for an Add-On product) or based on a variety of user attributes such as previous actions (for example an end user who topped up in the last 30 days), OS/App version, current location (via Geofence), and many others. Campaigns can be optimized using A/B testing, the most powerful tool in the marketer's repertoire. Full graphical reporting is readily available to measure the effectiveness of the campaign so learnings can be incorporated into future subsequent campaigns.

If you want to use this function but are concerned that your team need enhanced support, then awareX Marketing as a Service MaaS offering is a great way to ensure you get the customer engagement benefits fast.

Content Management System (CMS)

The Platform includes a content management system (CMS) which allows a CSP to change, modify and update a wide range of content without any need to refer to AwareX, it's in the hands of your marketing team to adjust such things as Video's, images, banners, links, terms and conditions (T&C), frequently asked questions (FAQ), help, teaser screens and surveys. And each of these can be in any language that you prefer.

CSP's can freely see all customer service messages, requests, survey replies, network issues and everything else that end users want to communicate to their service provider.

Scalability

AwareX products are deployed in customers with millions of end subscribers and multi-million plus monthly active devices. The Integration Platform which is the heart of the product and which serves as the primary interaction point with the

backend system is stateless and allows for easy horizontal scaling through simple server addition without limitation. It also employs mechanisms such as making data request calls in parallel to the backend systems wherever applicable, to reduce overall response times. On the infrastructure side, AwareX solutions run on AWS, the industry leading cloud services platform, which provides unparalleled scalability and reliability.

Standardized Architecture for all Channels

The awareX Platform has been architected to support a comprehensive digital engagement Omni-Client system not just an APP. This means that the product infrastructure supports of course Native Smartphone Apps but the same integrations, data processing and reformatting, security, analytics are all not just re-used but instantly available to other digital channels. AwareX have implemented Facebook Bots, SMS bots, Web portals and Voice channels for Alexa and Google. In future as, new digital channels evolve they will be able to be rapidly implemented leveraging the existing product infrastructure.

New Digital Channels

Because of the extensible product architecture AwareX is highly responsive to the introduction of new digital channels all of which fully utilize the existing infrastructure, integrations, security and scalability. This means a new digital channel can be added and supported for a minimal cost. The original digital channel was the Smartphone App but since its introduction AwareX has also introduced support for Feature phone bots, Smartphone bots, Facebook bots, Web portal and Voice systems Alexa and Google. Most recently Alexa has added a screen to its smart speaker device and a mixed voice, visual interface can be added. There will certainly be new digital channels in the future and the AwareX Platform is fully enabled to support them.

Conclusions

The AwareX Microservices Integration Platform delivers the ability to consolidate multiple back end Telecom and Enterprise data sources into a consistent, secure and scalable format that can be delivered consistently to any digital front-end device. New back end data sources and new digital clients can be added quickly and securely leveraging the Platforms inherent capabilities. Each new capability will be recognized under the Platforms holistic umbrella of monitoring, analytics and is available for marketing purposes.

If you want to achieve digital transformation or map out a journey from CSP to DSP then a swift effective implementation of the awareX digital engagement Platform enables you to show real change to your customers, staff and shareholders in a short space of time without the need for changing any back-end legacy systems. This is the single most effective way of enabling a digital customer engagement in the shortest possible time.